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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,097	07/09/2004	Kazuhiro Yamada	040302-0398	3096
22428 7590 12/22/2006 FOLEY AND LARDNER LLP SUITE 500 3000 K STREET NW WASHINGTON, DC 20007			EXAMINER CHUO, TONY SHENG HSIANG	
			ART UNIT	PAPER NUMBER
			1745	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		12/22/2006	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/501,097

Applicant(s)

YAMADA, KAZUHIRO

Examiner

Tony Chuo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 July 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 7/9/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 7/9/04 was filed on 7/9/04. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

3. The drawings filed on 7/9/04 are accepted by the examiner.

Claim Objections

4. Claim 12 is objected to because of the following informalities: in line 5, "0 C" and "α C" should be changed to "0°C" and "α °C". Appropriate correction is required.
5. Claim 16 is objected to because of the following informalities: the phrase "heat the water" in line 2 should be changed to "heats the water". Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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7. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear how a hot medium can flow through a rectification plate and where the rectification plate is located.

8. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear whether the hot medium flow passage is formed in a plurality of flow passage components that are stacked or a plurality of stacks.

9. Claim 15 recites the limitation "the heating member" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1, 7, 13, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970).

The Okamoto reference discloses a fuel cell system and a method of controlling the fuel cell system comprising: a fuel cell cooled by a second cooling medium such as ethylene glycol; a second circulatory route "72" that allows the second cooling medium to be circulated; a heat transfer device "90" disposed in a midway of the second circulatory

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route to heat the cooling medium; and a water tank "74" that stores water to be supplied to the fuel cell (See column 5, lines 18-57). Examiner's note: Claim 17 is interpreted as invoking 35 USC 112, sixth paragraph by using the "means for" language. However, Okamoto does not expressly teach a hot medium flow passage disposed in a water contact section of the water storage unit to allow the antifreeze solution, heated by the antifreeze heater, to flow; a hot medium flow passage that has an antifreeze solution inlet, through which the antifreeze solution flows in, located at a higher position than an antifreeze solution outlet, through which the antifreeze solution flows out; a water temperature detector detecting a water temperature in the water storage unit; a bypass unit bypassing the hot medium flow passage wherein when the detected water temperature exceeds a preset value the water temperature detector controls the bypass unit to allow the antifreeze solution to bypass the hot medium flow passage; and an antifreeze solution heated by the antifreeze heater that heats the fuel cell and the water in the water storage unit while flowing through the hot medium flow passage. The Kanbara reference discloses a cooling water duct "16" that circulates around a water tank "4" and the fuel cell "1"; a heater "15" that heats the cooling water; and a control unit "18" that bypasses the cooling water duct when the detected water temperature exceeds the freezing temperature of water (See paragraphs [0012],[0013],[0014]).

Examiner's note: It is implicit from the teachings of Kanbara that cooling water duct inlet is located at a higher position than the cooling water duct outlet (See Drawing 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto fuel cell system to include a hot medium

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flow passage disposed in a water contact section of the water storage unit to allow the antifreeze solution, heated by the antifreeze heater, to flow; a water temperature detector detecting a water temperature in the water storage unit; and a bypass unit bypassing the hot medium flow passage wherein when the detected water temperature exceeds a preset value the water temperature detector controls the bypass unit to allow the antifreeze solution to bypass the hot medium flow passage in order to be able to operate the fuel cell system under low temperature environments by using the heated antifreeze to directly melt the water in the water tank.

12. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) as applied to claim 1 above, and further in view of Koizumi et al (US 4818845). In addition, the Okamoto reference discloses a circulation pump "78" that draws water stored in the water tank "74" to an outside (See Figure 4). However, Okamoto as modified by Kanbara et al does not expressly teach a suction conduit heater section disposed around a periphery of a water suction conduit of the water pump to allow the heated antifreeze solution to flow. The Koizumi reference discloses an electric heater "24" disposed around a periphery of a water suction pipe "23" of the bubble pump "20" (See Figure 1 and column 3 line 62 to column 4 line 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto/Kanbara fuel cell system to include a suction conduit heater section disposed around a periphery of a water suction conduit of the water pump to allow the heated antifreeze solution to flow in order

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to prevent the water suction conduit and the hot medium flow passage inlet from freezing under cold temperature environments.

13. Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) as applied to claim 1 above, and further in view of Gerstmann et al (US 5772113). However, Okamoto as modified by Kanbara et al does not expressly teach an antifreeze rectification plate disposed in the hot medium flow passage to rectify flow of the antifreeze solution; a hot medium flow passage that is disposed along at least a portion an inner wall of the water storage unit wherein the hot medium flow passage is formed in a plurality of stacks to allow mutually adjacent, stacked hot medium flow passage components to be sealed watertight, and the stacked hot medium flow passage components form at least a portion of a side wall of the water storage unit and wherein the hot medium flow passage is formed in a spiral shape. The Gerstmann reference discloses a coolant-to-water heat exchanger "55" that surrounds the water storage tank "31" wherein hot coolant passes through the coil "80" that is wrapped around the tank in a helical fashion or multiple parallel coils (See column 4, lines 50-62 and Figure 2A). Examiner's note: The antifreeze rectification plate is construed as the flattened part of the tubing that wraps around the water storage tank taught by Gerstmann et al (See column 2, lines 5-6). The stacked hot medium flow passage components that forms at least a portion of a side wall of the water storage unit is construed as the parallel coils wrapped around the water tank taught by Gerstmann et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the

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Okamoto/Kanbara fuel cell system to include an antifreeze rectification plate disposed in the hot medium flow passage to rectify flow of the antifreeze solution; a hot medium flow passage that is disposed along at least a portion an inner wall of the water storage unit wherein the hot medium flow passage is formed in a plurality of stacks to allow mutually adjacent, stacked hot medium flow passage components to be sealed watertight, and the stacked hot medium flow passage components form at least a portion of a side wall of the water storage unit and wherein the hot medium flow passage is formed in a spiral shape in order to more efficiently transfer the heat from the hot medium flow passages to the water tank by improving the thermal contact between the flow passages and the water tank.

14. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) as applied to claim 1 above, and further in view of Breault et al (US 6699612). However, Okamoto as modified by Kanbara et al does not expressly teach a switch-over unit expelling the antifreeze solution from the hot medium flow passage to allow air to be admitted to the hot medium flow passage in place of the expelled antifreeze solution; and an antifreeze accommodating unit that, when the hot medium flow passage is admitted with air in place of the antifreeze solution, allows the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated. The Breault reference discloses a drain vent "160" and drain valve "158" that are controlled to admit air to assist in the drainage of the antifreeze coolant and a coolant accumulator "64" that allow the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated

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(See column 9, lines 45-52 and Figure 2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto/Kanbara fuel cell system to include a switch-over unit expelling the antifreeze solution from the hot medium flow passage to allow air to be admitted to the hot medium flow passage in place of the expelled antifreeze solution; and an antifreeze accommodating unit that, when the hot medium flow passage is admitted with air in place of the antifreeze solution, allows the air to expel the antifreeze solution such that the expelled antifreeze solution is accommodated in order to avoid degradation of the antifreeze coolant in the start-up heat exchanger by draining the antifreeze coolant.

15. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Yamada et al (US 5482790). However, Okamoto as modified by Kanbara et al and Breault et al does not expressly teach air to be admitted to the hot medium flow passage in place of the antifreeze solution that includes combustion gas resulting from a combustor disposed in the antifreeze heater. The Yamada reference discloses air heated by mixing the combustion gas from the reforming unit with the air that is fed to the cooling plate "12d" which is part of the cooling flow passage (See column 15, lines 27-30). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto/Kanbara/Breault fuel cell system to include air to be admitted to the hot medium flow passage in place of the antifreeze solution that includes combustion gas resulting from a combustor disposed in the antifreeze heater in

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order to shorten the period of time that elapses during the initial time until the generation of electric energy is started with the fuel cell by using combustion gas to heat the fuel cell (See column 15, lines 37-44).

16. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Roberts et al (US 2001/0055707). However, Okamoto as modified by Kanbara et al and Breault et al does not expressly teach an air storage unit storing air to be introduced into the hot medium flow passage in place of the antifreeze solution. The Roberts reference discloses purging the coolant water passages by circulating compressed air through them (See paragraph [0049]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto/Kanbara/Breault fuel cell system to include an air storage unit storing air to be introduced into the hot medium flow passage in place of the antifreeze solution in order to speed the draining of the antifreeze solution from the hot medium flow passage by using compressed air.

17. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Bonville (US 6248462). However, Okamoto as modified by Kanbara et al and Breault et al does not expressly teach an antifreeze temperature detector detecting the temperature of the antifreeze solution in the hot medium flow passage wherein when the temperature of

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the antifreeze solution is detected to fall in a value higher than 0 C and lower than $\alpha.C$ ($\alpha.C$: heat capacity reference temperature of the antifreeze solution), the antifreeze temperature detector controls the hot medium change-over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution. The Bonville reference discloses a thermal management apparatus "30" that includes antifreeze temperature sensors that detect the temperature of the antifreeze solution in the coolant flow channels wherein the antifreeze solution transfers a portion of its heat to the fuel cell assemblies and after which the antifreeze flow are exhausted from the fuel cell stack (See column 6, lines 13-25, column 7 line 67 to column 8 line 3).

Examiner's note: The thermal management apparatus taught by Bonville is capable of detecting when the temperature of the antifreeze solution falls in a value higher than 0°C and lower than αC to control the hot medium change over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto/Kanbara/ Breault fuel cell system to include an antifreeze temperature detector detecting the temperature of the antifreeze solution in the hot medium flow passage wherein when the temperature of the antifreeze solution is detected to fall in a value higher than 0 C and lower than $\alpha.C$ ($\alpha.C$: heat capacity reference temperature of the antifreeze solution), the antifreeze temperature detector controls the hot medium change-over unit so as to allow the air to be admitted to the hot medium flow passage in place of the antifreeze solution in order

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to prevent the antifreeze solution from contaminating the reactant gases after the fuel cell stack is heated above freezing.

18. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto (EP 0823743) in view of Kanbara et al (JP 2000-149970) and Breault et al (US 6699612) as applied to claim 8 above, and further in view of Nelson (US 5421475). However, Okamoto as modified by Kanbara et al and Breault et al does not expressly teach a water storage unit that includes a double-layer structure composed of an inside tank component and an outside tank component, between which the hot medium flow passage is formed, and a heat insulation member with a specific gravity greater than the air and less than the antifreeze solution is moveably received in the hot medium flow passage; wherein the heating member includes a plurality of members smaller in size than a flow sectional area of the hot medium flow passage formed between the inside tank component and the outside tank component. The Nelson reference discloses a foam insulation material that is formed into a movable annular collar "22" between the inner wall surface of the outer shell and the outer wall surface of the inner water tank and tapes "50" that are smaller in size than a flow sectional area of the annular space between the outer shell and inner water tank (See claim 6 and Figure 1). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okamoto/Kanbara/Breault fuel cell system to include a water storage unit that includes a double-layer structure composed of an inside tank component and an outside tank component, between which the hot medium flow passage is formed, and a heat insulation member with a specific gravity greater

than the air and less than the antifreeze solution is moveably received in the hot medium flow passage; wherein the heating member includes a plurality of members smaller in size than a flow sectional area of the hot medium flow passage formed between the inside tank component and the outside tank component in order to further improve the thermal efficiency of the water tank by insulating the space between the double layer structure of the tank.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's traner, Susy Tsang-Foster can be reached on (571) 272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

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